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# PULPWOOD SUPPLY AND THE PAPER INDUSTRY

## Report of a Conference of the British Paper and Board Makers' Association London, 12th June 1968

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### FOREWORD

On 12th June 1968, the British Paper and Board Makers' Association held a conference in London, which was attended by representatives of various other bodies interested in paper-making, forestry and home timber production. Its purpose was to consider the supplies of pulpwood coming forward up to the end of the century. This publication comprises the three papers presented at the conference; a summary of the discussion; and a report of the summing up by the two Joint Chairmen.

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# INTRODUCTION

By T. H. FRANKEL

In some overseas countries it was the need of the forests to find an outlet that led to the development of forest industries by the companies and associations that owned the forests. In other countries pulp companies have planted or purchased forests in order to have a continuing source of pulpwood for their mills.

In Britain the conditions are not such that pulpmills should own or control the forests.

Under British conditions it is necessary to replace the common ownership of forests and forest industries by common thinking between state and private growers on the one hand, and the paper and sawmilling industries on the other. ("Paper," as used here, includes paper board).

Long-term thinking comes naturally to the forester who by definition has to make an investment that can only be recouped after several decades. The paper industry must learn to think in the medium to long-term to find solutions that will be valid in the context of the next twenty to thirty years.

The nature, type and location of the British paper industry reflects Government policies over the past generation. Wherever possible the future aim of the industry must be to add pulping capacity, based on home-grown wood, to existing paper mills. To start an industry from scratch—the "green fields" solution—poses greater problems.

A recent report on the paper industry has drawn the industry's attention to its responsibilities for future industrial planning. But the paper industry has also moral social responsibilities. Thus if the industry cannot see itself as a future market for the growing output from British woodlands the industry must stop asking for more trees to be planted. Equally, if the grower feels unable to accept that British pulpwood prices will be governed by prices paid by overseas pulpmills his duty is to make his views known now so as not to build up a problem for the future.

The British grower must be willing to accept a "delivered mill" price similar to that obtained by the grower in Sweden for pulpwood delivered to a Swedish mill. The Swedish paper industry thinks that Swedish pulpwood is too expensive and is building new capacity in countries with lower pulpwood prices. However, the British pulp and paper industry is near to the market for its end products and should therefore be able to pay the Swedish price.

In Britain at the present time only about one third of the delivered price of pulpwood finds its way into the grower's pocket; the rest goes on harvesting and transporting the tree to the mill. The grower must try to get a greater share of the delivered price and this can be achieved by lowering the cost of harvesting wood through greater mechanisation, with the appropriate changes in forest management.

Originally the mandate of the Forestry Commission was to build up a strategic reserve of growing timber. The objective has changed to that of economic management of the forest estate. But over the next decade or two much of the pulpwood will come from plantations laid down before the policy change in 1958, when choice of species was made largely on the basis of maximum volume production in the shortest space of time. By research and development the paper industry can and must help to make use of those species which are difficult to pulp by existing methods.

Although the conference is mainly concerned with the utilisation of trees that are already growing, some thought must be given to the location of new plantations. The transport of wood over long distances will always be a burden and one that must in fact be borne by the grower. When creating new plantations

those responsible must always have in mind this transport problem. They must also have in mind the economies which stem from scale —small scattered woodlands will always be more expensive to manage and to harvest than large compact forests.

Private growers in Britain share many of the problems of the Forestry Commission, but have in addition the problem of organising their marketing arrangements from many relatively small woodland estates. The difficulties involved are recognised and understood, but it is in the interests of the private sector to find solutions acceptable to the majority of the owners in a region. When the private growers have assumed the same contractual responsibilities as the Forestry Commission they should then get the same prices as the Forestry Commission. The minority who will not join in such marketing schemes will be able to sell their wood when the market is firm, but will suffer when the market is weak.

The home timber trade has fulfilled the role of harvesters and sawmillers, converting the material below sawlog sizes to pitwood and other specifications demanding special skills. Will the home trade wish to fell and extract in the future where the main product is pulpwood? Or will this work be done mainly by specialised contractors or by the grower? In clear felling the trade will have a role to fulfil where their skills, in sorting out the relatively high proportion of sawlog material, can be utilised; but their role in harvesting thinnings is less easy to foresee.

Whether or not the home trade continues to play a major role in harvesting timber, as sawmillers they will continue to play a major part in utilising future wood supplies. A market for sawmilling residues will be essential to the sawmill of the future and the paper industry and the particle board (wood chipboard) industries can provide the necessary outlets. Important capital investment decisions will have to be taken and it will be vital to those making decisions to look well ahead and not spend money on sawmilling schemes that have no future in the long-term scheme of things.

## THE FUTURE OF WOOD SUPPLIES IN GREAT BRITAIN

By F. C. HUMMEL and A. J. GRAYSON[1]

### Introduction

The total production of broadleaved and coniferous wood in Britain, now running at about 100 million hoppus feet or some 3½ million tons per year, will double within the next 20 years and by the end of the century will probably be nearly three times the present amount. When set against the volume of imports this country buys, the figures do not appear to be so impressive. They represent about 8% by volume of imports today, and if, for purposes of illustration, we assume that consumption will grow at a rate of around 3% over the next twenty years, they will still only amount to 8% in 1990. Nevertheless the rate of increase of home-produced wood supplies—about 3% compound per year—is impressive and the absolute increases by no means negligible. By 1990 the additional supply could feed a further five pulp mills of the scale of the Fort William mill of Wiggins Teape, plus 50 sawmills of one million hoppus feet yearly capacity, plus particle board mills using some roundwood plus wood waste.

What is the relevance of these long-term increases to us today? The main justification for a long-term forward look is that many of the decisions we make today have long-term implications. This applies both to the grower of timber and the manufacturer of wood products. Experience has shown that what, looking into the immediate future, may be the

[1] Our thanks are due to R. T. Bradley and G. M. L. Locke of the Forestry Commission, for help with the preparation of the data for this paper.

most obvious course of action may appear less attractive if we look further ahead. The life of capital equipment used in wood-based industry is usually less than that of our trees but it is long enough to make a long-term view necessary for a proper understanding of the interdependence between grower and industry, and between different parts of the timber-using industry itself.

This paper indicates the increase in future supply likely to occur between 1970 and the year 2000, and changes in the size and species composition of coniferous wood production as well as in the regional distribution of that supply. It will be noted that the figures differ slightly from those given in Forest Record 52[1] because more up-to-date information has since become available.

At the end of the paper we touch on the question of the possible implications of the future supply position on the structure and location of wood-based industry.

All volumes are given in terms of tons of fresh-felled wood with bark. This unit is convenient for two main reasons. First, it is increasingly used as a measure for sale. Secondly, it is roughly equivalent to one cubic metre, a measure which is likely to be the standard unit of volume measure in a few years' time; incidentally, it comes very close to the metric tonne.

For comparisons, we assume that there are about 30 hoppus feet to the ton of fresh-felled wood. About 2.7 tons of wet wood with bark are needed to provide one ton of bone-dry wood fibre, and 8.3 tons of wet wood with bark are needed to yield one standard of sawn softwood (165 true cubic feet).

### Forecasts of Production

The basic forecasts discussed here assume present-day management practices but, as will be explained later, these could be varied to yield different levels of production in different years.

### Conifers

Table 1 gives the forecast for coniferous wood.

**TABLE 1**

**Production Forecast for Conifers, Great Britain**

Millions of tons of wood with bark per year

| Year | Forestry Commission (F.C.) | Private Woodlands (P.W.) | Total |
|---|---|---|---|
| 1970 | 1.27 | 1.07 | 2.34 |
| 1980 | 2.64 | 1.53 | 4.17 |
| 1990 | 4.33 | 2.00 | 6.33 |
| 2000 | 5.33 | 2.47 | 7.80 |

*Notes:* The forecast volumes for 1970 are based on the current rate of production adjusted for the expected increase in the area of woodland in the thinning stage by 1970. The forecasts for 1980, 1990 and 2000 reflect the full potential of the woodland areas expected to be in production at those dates. It must be emphasised that these forecasts are tentative, especially the values shown for the later years, and for private woodlands, which, in the past, have sold little over half of the calculated potential.

[1] *Home Grown Roundwood:* a survey of estimated industrial requirements 1965-80 compared with potential production, by B. W. Holtam. Forest Record 52, H.M.S.O. revised edition 1966. 4s. 6d.

The main points to emerge from Table 1 are that:

(*a*) the total shows an average rate of rise of 4% per year over the years 1970 to 2000, with a more marked increase in the eighties than any other decade,

(*b*) the proportion from Commission woodlands is expected to rise from 54% in 1970 to about 68% in 2000.

### Hardwoods

The future trend of hardwood supplies is different. The proportion of broadleaved trees planted in recent decades has been small but there are substantial volumes in old hardwood stands. The present rate of production from all sources including hedgerows is about 1.5 million tons per year, the bulk of it from private woodlands. This level could well be maintained for many decades. A cut of half as much again could be maintained until the turn of the century, but in practice such a rapid rate of removal is unlikely because of amenity and other considerations. Our estimate is that the rate of cut will continue at about the current level, but the picture could change if, for example, there were significant developments in the technology of hardwood utilisation.

### Coniferous Production by Size Classes

In considering the forecasts of coniferous production in greater detail, we begin by differentiating two size categories: one between 3 and 7 inches top diameter over bark (minimum log length 10 feet), the other over 7 inches. The under bark diameters would be about $\frac{1}{2}$ to $\frac{3}{4}$ inch less. The categories are meant to distinguish sawlog-sized material from smaller-sized roundwood. Table 2 shows the breakdown of future coniferous production by size-classes.

**TABLE 2**

**Size-Class Composition of Future Production of Conifers, Great Britain**

Quantities in millions of tons (with bark) per year

| Year | Material of less than 7-inch top diameter | | | Material of 7-inch top diameter or over | | | Volume of logs 7-inch and over as percentage of total volume | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.C. | P.W. | Total | F.C. | P.W. | Total | F.C. | P.W. | Total |
| 1970 | 0.86 | 0.42 | 1.28 | 0.41 | 0.65 | 1.06 | 33 | 61 | 45 |
| 1980 | 1.60 | 0.73 | 2.33 | 1.04 | 0.80 | 1.84 | 38 | 52 | 44 |
| 1990 | 2.40 | 1.07 | 3.47 | 1.93 | 0.93 | 2.86 | 45 | 47 | 45 |
| 2000 | 3.00 | 1.37 | 4.37 | 2.33 | 1.10 | 3.43 | 44 | 45 | 44 |

The main points to note from this Table are that:

(*a*) the proportion of sawlog-sized material will remain fairly steady at about 45%.

(*b*) the proportion of larger material (7 inch top diameter or over) in Forestry Commission production rises,

(*c*) the proportion of large material from private woodlands falls quite markedly although it should be noted that this result is heavily dependent on the rate of cutting of over-mature stands which is assumed.

It is, of course, true that there can be no one dividing limit between sawlogs and small-wood: the division is mainly a matter of economics, and there are some mills which saw logs down to a top diameter of 5½ inches with bark. Shifting the dividing line between the two categories from 7 inches down to 6 would increase the quantity of sawlog sizes shown in Table 2 by a little more than one quarter, while increasing it from 7 to 8 inches would reduce the quantities a little less than one quarter. About 40% of the volume of a sawlog is mill waste which could be used for pulping, chipboard manufacture, briquetting, etc. In practice, only about one-half of this waste seems likely to be recovered for use in another process.

### Coniferous Production by Species Groups

For utilisation purposes it is useful to group the conifers into three sets of species: pines, spruces and other. The breakdown is shown in Table 3.

## TABLE 3

**Species Composition of Future Production of Conifers, Great Britain**

Quantities in millions of tons (with bark) per year

| Year | Pines | | | Spruces | | | Larches and others | | | Percentages of total by species groups | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F.C. | P.W. | Total | F.C. | P.W. | Total | F.C. | P.W. | Total | Pines | Spruces | Larches and others |
| 1970 | 0.35 | 0.59 | 0.94 | 0.61 | 0.19 | 0.80 | 0.31 | 0.29 | 0.60 | 40 | 34 | 26 |
| 1980 | 0.54 | 0.63 | 1.17 | 1.37 | 0.33 | 1.70 | 0.73 | 0.57 | 1.30 | 28 | 41 | 31 |
| 1990 | 1.13 | 0.83 | 1.96 | 2.40 | 0.57 | 2.97 | 0.80 | 0.60 | 1.40 | 31 | 47 | 22 |
| 2000 | 1.33 | 1.00 | 2.33 | 3.20 | 0.84 | 4.04 | 0.80 | 0.63 | 1.43 | 30 | 52 | 18 |

The principal features illustrated by Table 3 are:

(*a*) the increase in the proportion of spruces in total production from 34% in 1970 to 52% in 2000.

(*b*) the dominance of spruce in production from Forestry Commission forests and the dominance of pines in production from private woodlands,

(*c*) the substantial proportion of larches and other conifers which, however, falls after reaching 31% of the total in 1980 to 18% in 2000.

### Geographical Distribution of Coniferous Production

In order to show the distribution of future production of conifers in different parts of the country, 16 regions have been differentiated as shown on the map, p. 14. These "catchment areas," as they might be termed, have been chosen primarily with the interests of forest industry, either actual or potential, in mind, although for convenience some adjustments of boundaries have been made to fit in with Forestry Commission Conservancies or counties. Table 4 shows the regional breakdown.

## TABLE 4

### Regional Breakdown of Future Production of Conifers

(*See Figure* 1, *pages* 14-15)

Millions of tons (with bark) per year

| Year | 1970 | | | 1980 | | | 1990 | | | 2000 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F.C. | P.W. | Total | F.C. | P.W. | Total | F.C. | P.W. | Total | F.C. | P.W. | Total |
| Region | | | | | | | | | | | | |
| 1 (N. Scot.) | .17 | .11 | .28 | .30 | .13 | .43 | .43 | .17 | .60 | .70 | .20 | .90 |
| 2 (NE. Scot.) | .09 | .08 | .17 | .17 | .13 | .30 | .30 | .23 | .53 | .33 | .30 | .63 |
| 3 (Perth-Fife) | .06 | .08 | .14 | .10 | .13 | .23 | .17 | .17 | .34 | .20 | .20 | .40 |
| 4 (W. Scot.) | .17 | .08 | .25 | .30 | .13 | .43 | .50 | .17 | .67 | .73 | .20 | .93 |
| 5 (SE. Scot.) | .03 | .06 | .09 | .07 | .07 | .14 | .13 | .07 | .20 | .17 | .07 | .24 |
| 6 (SW. Scot.) | .06 | .08 | .14 | .23 | .10 | .33 | .40 | .17 | .57 | .53 | .20 | .73 |
| 7 (Tyne-Tees) | .09 | .08 | .17 | .20 | .10 | .30 | .33 | .13 | .46 | .40 | .17 | .57 |
| 8 (Lakes) | .03 | .02 | .05 | .07 | .03 | .10 | .13 | .03 | .16 | .17 | .03 | .20 |
| 9 (Yorks.) | .03 | .06 | .09 | .07 | .07 | .14 | .13 | .07 | .20 | .13 | .07 | .20 |
| 10 (Lancs.) | — | — | — | — | — | — | — | — | — | — | .03 | .03 |
| 11 (E. Mid.) | .03 | .02 | .05 | .07 | .03 | .10 | .10 | .07 | .17 | .10 | .10 | .20 |
| 12 (London) | .14 | .16 | .30 | .23 | .24 | .47 | .47 | .30 | .77 | .53 | .37 | .90 |
| 13 (Hants.) | .06 | .02 | .08 | .07 | .03 | .10 | .10 | .03 | .13 | .10 | .03 | .13 |
| 14 (Severn) | .10 | .14 | .33 | .43 | .24 | .67 | .64 | .26 | .90 | .68 | .34 | 1.02 |
| 15 (Mid-Wales & W. Mid.) | .06 | .06 | .12 | .20 | .07 | .27 | .30 | .10 | .40 | .33 | .13 | .46 |
| 16 (N. Wales & Ches.) | .06 | .02 | .08 | .13 | .03 | .16 | .20 | .03 | .23 | .23 | .03 | .26 |
| TOTAL | 1.27 | 1.07 | 2.34 | 2.64 | 1.53 | 4.17 | 4.33 | 2.00 | 6.33 | 5.33 | 2.47 | 7.80 |

The principal points to be noted on the regional distribution of future production are:

(*a*) the very uneven distribution of production from the various regions, which reflects the variation in the existing area of conifer forest and in the area in the thinning stage at various dates,

(*b*) mainly as a result of the recent concentration of Forestry Commission planting in Scotland, the increase in production which is likely to take place in that country so that Scotland's contribution to the total is likely to rise from 45% in 1970 to 50% at the end of the century,

(*c*) the increasing proportion of total supplies arising in regions which are distant from industrial centres, whether these are considered from the point of view of locations of wood-based industry, or of markets for the processed products.

The species distribution in conifer production from the various regions can be summarised thus:

(*a*) the North and East of Scotland, and all Eastern counties of England, South of the Tees, including the New Forest, (i.e. Regions 1, 2, 3, 9, 11, 12, 13) show a higher proportion of pines than the average for the country as a whole,

(*b*) West and South Scotland, the four Northern counties of England and North Wales (i.e. Regions 4, 5, 6, 7, 8, 16) show a higher proportion of spruce,

(*Continued on page 10*)

## TABLE 5

**Regional Breakdown of Future Production of Conifers in 1970 and 2000 showing approximate Quantities of Wood Fibre and Sawnwood which could be Produced**

| Product | | Wood Fibre | | | Sawn Softwood | | |
|---|---|---|---|---|---|---|---|
| Units | | Thousands of bone-dry tons (rounded to nearest 10,000 tons) (*a*) | | | Thousands of standards (*b*) | | |
| Year (*c*) | | 1970 | 2000 | Increase | 1970 | 2000 | Increase |
| Region | | | | | | | |
| 1 | (N. Scot.) | 70 | 220 | 150 | 15 | 49 | 34 |
| 2 | (N.E. Scot.) | 40 | 150 | 110 | 9 | 34 | 25 |
| 3 | (Perth-Fife) | 40 | 100 | 60 | 8 | 22 | 14 |
| 4 | (W. Scot.) | 60 | 230 | 170 | 14 | 50 | 36 |
| 5 | (S.E. Scot.) | 20 | 60 | 40 | 5 | 13 | 8 |
| 6 | (S.W. Scot.) | 40 | 180 | 140 | 8 | 40 | 32 |
| 7 | (Tyne-Tees) | 40 | 140 | 100 | 9 | 31 | 22 |
| 8 | (Lakes) | 10 | 50 | 40 | 3 | 11 | 8 |
| 9 | (Yorks.) | 20 | 50 | 30 | 5 | 11 | 6 |
| 10 | (Lancs.) | — | 10 | 10 | — | 1 | 1 |
| 11 | (E. Midlands) | 10 | 50 | 40 | 3 | 11 | 8 |
| 12 | (London) | 70 | 220 | 150 | 16 | 49 | 33 |
| 13 | (Hants.) | 20 | 30 | 10 | 4 | 7 | 3 |
| 14 | (Severn) | 80 | 250 | 170 | 18 | 55 | 37 |
| 15 | (Mid-Wales & W. Mid.) | 30 | 110 | 80 | 6 | 25 | 19 |
| 16 | (N. Wales & Ches.) | 20 | 60 | 40 | 4 | 14 | 10 |
| TOTAL FOR GREAT BRITAIN | | 570 | 1910 | 1340 | 127 | 423 | 296 |
| | | 000 tons of fibre | | | 000 standards | | |

*Notes:* (*a*) the figure for sawnwood has been calculated by taking 45% of the total quantity of wood (see Table 2) as the volume of material that might be sawn, and dividing by 8.3 to convert from tons of wet wood with bark to give standards. The figure of 45% relates to the proportion of total volume 7 inches or more in diameter and is of course only an average for the whole country.

(*b*) the figure for bone-dry fibre has been calculated by taking 55% of the total quantity of wood plus 25% of the quantity that might be sawn (to represent material that might be used for pulping or board making), i.e. a total of 66% of the total quantity and dividing by 2.7 to convert from tons of wet wood to give tons of bone-dry fibre.

(*c*) The basic figures taken from Table 4 are only indicative and the figures in Table 5 should be regarded in that light.

(*c*) the rest of Wales and the South-west of England (i.e. Regions 14 and 15) show a relatively high proportion of other species.

Table 5, page 9, translates the forecasts of potential production of conifers by regions into quantities of products—tons of bone-dry fibre and standards of sawnwood—that could together be made available from the projected increase in supplies of home-grown coniferous roundwood.

## FLEXIBILITY IN THE TIMING OF SUPPLIES

The forecasts quoted in Table 1 to 5 have been based on conventional practice. For example, in a typical conifer stand it is assumed that thinning is begun at 25 years, is repeated every five years or so until, say, 50 years, and the stand is clear-felled at 60 years. (The forecasts for private woodlands assume rather conservative cutting rates in older stands compared with those assumed for Commission forests.) But under certain circumstances, e.g. where growth is poor or the risk of windblow great, it may be more profitable to vary the timing and intensity of cut so that thinning starts later or is undertaken at a lower rate, or not at all, and fellings are brought forward, or postponed, by 10, 20 or more years.

Another way of influencing production is by the use of fertilisers. Fertilisation is commonly undertaken at the time of planting, and it is known that on many sites substantial, but not necessarily profitable, gains in growth and hence yield may also be produced by fertilising in the middle and later phases of the rotation. Thus foresters have some scope for raising the total production from a given acre of woodland, and a great deal of scope for altering the timing of the total yield that a crop is capable of providing.

The effects of applying different cutting regimes may be illustrated by forecasts compiled recently for all woodlands in the Scottish Highlands and fringe areas (roughly Regions 1 to 4 as shown on the map). These assume that planting continues in the period 1970 to 1990 at an average rate of 27,000 acres per year to give a total planted area of 1.5 million acres in 1990.

### TABLE 6

**Effect of Different Cutting Regimes on Total Production in the Highlands**

Millions of tons (with bark) per year

| Year | Annual Production | | |
|---|---|---|---|
| | (*a*) with thinning and an average rotation of 60 years | (*b*) with no thinning, and felling at 70 years | (*c*) with no thinning, and felling at 50 years |
| 1970 | 0.9 | 0.8 | 0.8 |
| 1980 | 1.5 | 1.0 | 1.0 |
| 1990 | 2.1 | 1.4 | 1.5 |
| 2000 | 2.9 | 2.1 | 2.9 |
| 2010 | 3.3 | 4.8 | 6.0 |
| Period | Cumulative Production | | |
| 1966 to 2015 | 107 | 101 | 122 |

As will be seen from Table 6, the total production over the long term (to the year 2015) is broadly similar for the three regimes, but the pattern of increase in annual rates of production is very different. Such changes in management may be instituted from different future dates and they may, of course, be applied differentially to the woodlands in a region.

Apart from such far-reaching management changes, the grower may also adjust production in the short term of between one and five years by stopping thinning for a time, bringing forward the thinning of particular blocks of forest or altering the year in which a particular stand is felled. Wood may be stored, or removed from stock at varying rates. In contrast to, say, a car manufacturer, the forester is in the fortunate position that his product does not become out of date if he does not sell it in a particular year, and since, unlike any manufacturer, his plant (the tree crop) and its product (trees) are the same, he can actually anticipate future production by drawing on his stock of productive equipment.

Major adjustments of cutting policy, leading to the sort of changes in supply indicated in Table 5, are decisions of policy which are likely to be related either to changes in management objectives *per se*, for example, in the financial objectives of growers, or to changes in silvicultural technique as a result of new knowledge, for example, of the consequences of fertilisation or no thinning. Such changes in practice are likely to be rather rare events, and the resulting changes in the pattern of supply over time are likely to be effective over fairly long periods. The shorter-term adjustments which have been mentioned, such as the bringing forward of production to meet the requirement of a new mill or the expansion of an existing one, are of a rather different kind. Since the main criterion by which a particular production pattern is decided is a combination of economic and other objectives, some incentive must be provided for a change in practice. Thus a departure from the normal treatment could be justified if the loss otherwise caused were offset by a higher price. Alternatively, the cost and revenue implications for the grower may be subordinated to the requirements of the economy at large, but in order that such a regional or national policy change may be effective, other inducements than price will have to be offered, for otherwise the required supply response will not be produced. It is worth remembering that changes in cutting practice, whether on a long-term or a short-term basis, are more likely to have marked effects on production from State forests than private woodlands, simply because the Forestry Commission is a single organisation.

## Supplies of Roundwood from Abroad

In considering the future supply position of wood-using industries in Britain, it is relevant to mention the prospects for imports of unprocessed wood.

### Conifers

There has been a marked fall in our imports of coniferous roundwood (pulpwood, props and sawlogs) over the past fifteen years, but the total quantity bought of about 0.7 million tons (1967 figure) is still double the volume of hardwood log imports. There will always be fluctuations in the level of international trade in roundwood owing to imbalances between the cut of wood and the demand for it by mills in the exporting countries. It seems clear, however, that the flow of roundwood will be curtailed in favour of exports of processed products (sawn softwood, pulp, paper and board). Indeed, some countries have explicitly banned, while others have restricted, the export of unprocessed roundwood in order that home manufacturers and the economy can gain from the value added in processing. The

potential[1] of fast-growing coniferous plantations in tropical and sub-tropical countries—not traditional suppliers of roundwood to Britain—is difficult to gauge. But the distance from this country, the lower costs of transporting processed material rather than logs, the rising demand for wood in developing countries, and the likely development of processing plant in those countries, all combine to make it unlikely that they will provide any significant contribution to Britain's requirements of roundwood.

The conclusion that we may tentatively draw is that so far as unprocessed wood is concerned industry in Britain will necessarily come to rely more and more heavily on home-grown material for supplies.

**Hardwoods**

In the fifties and early sixties Britain's imports of hardwood logs amounted annually to about 0.5 million tons, but in recent years they have fallen to 0.33 million tons. Over a wide range of species and dimensions, these imported logs are not directly competitive with home-produced material. During the past decade, world exports of hardwood logs have grown faster than exports of sawn hardwood, and it has been suggested by F.A.O.[2] that the bulk of total volume of trade in tropical hardwoods will be in the log form up till 1975. But the desire of developing countries to add more value to their raw materials before export suggests that the import of hardwood logs is bound to fall with time.

## The Influence of Home Grown Supplies on the Development of Wood-based Industries

The expected increase in supplies of home grown wood will afford industry an opportunity for expansion and structural change, including, no doubt, rationalisation. The grower has a close interest in all aspects of this industrial development: other things being equal, the more efficient the industry, the better the price it can afford to pay for its raw material. In the context of this paper we are more particularly concerned with the effect of the changing supply pattern on the type and location of forest industries, the timing of expansion and the need for vertical and horizontal co-ordination. Relevant to a consideration of the problem is the fact that, as already noted, the proportion of the total volume of wood products made from home-grown wood is likely to remain small; accordingly, an important question to be settled is: which imports can most profitably be replaced by production based on home supplies of wood?

**Type of Industry**

The price of logs for sawing and for the manufacture of plywood has generally been higher than the price of wood for pulping and chipboard manufacture. There is little indication at present that this situation will change, although the gap may narrow. Recent developments, including the profile chipper, have, in fact, tended to reduce the size of log at which sawing becomes profitable. These developments at the same time enable the more efficient utilisation of sawmill waste for pulping and chipping. Two conclusions may be drawn:—

(*a*) Material which it is profitable to saw should normally be used for that purpose.

(*b*) Co-ordination is needed to ensure the profitable use of sawmill waste for chipping or pulping.

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[1] F.A.O. report on the 1967 World Symposium on Man-made Forests, *Unasylva* 21 (3-4), 1967 (especially Appendix 3).

[2] See Chapter III of Wood: World Trends and Prospects, *Unasylva* 20 (1-2), 1966.

It is, of course, recognised that a departure from these general principles may pay under certain conditions.

Within the pulping industry, some important choices have to be made over the type of pulp to be produced. These decisions will have far-reaching consequences because of the large capital investment involved, but they will depend largely on technological considerations and world prices and are primarily a matter for the industry itself.

### Size and Location of Plant

Size and location of plant are best considered together because economies of scale have to be weighed against the higher transport costs which result from having to increase the radius of supply. As will be seen from the map, the distribution of future supplies of home-grown roundwood is spread wide over the country, and, of course, the production within any region is widely scattered among different forests and estates. The dispersed nature of the supply, and the overland distances from forests to mill implied, mean that transport is a major problem, and careful planning of mill siting in relation to forests and consuming centres, as well as of the operation of transport systems, is needed if, as they must be, costs are to be kept low.

It is worth noting that the scale economies of manufacture found with existing pulping technology are considerable, and that the reduction in processing cost with increase in mill size normally outweighs the increased transport cost of logs into the mill. This conclusion may, of course, be upset if new development in pulping technology make it possible to pulp economically much smaller quantities of material. With sawmills, however, the cost reductions with increase in mill size are likely to be much smaller and increases in transport costs, and hence distance, become critical at a smaller radius. Because of the impact of transport cost to mill, manufacturing processes which do not show big economies of scale may well be relatively more advantageous in Britain than in countries where the concentration of forests is higher. However, the developing technical and economic interdependence of different types of processing implies that there must be some matching of the requirements of different types of process, and the location of individual plants should not be considered in isolation. In other words, the siting of sawmills, pulpmills, particle board plants, etc. should be co-ordinated in spite of the obvious difficulties involved.

### Timing of New Developments

The increase in supplies which results from the conventional management of an expanding estate is usually by relatively small annual steps. The establishment of large new industries, on the other hand, may require increases by much larger but less frequent steps. Industrial expansion must therefore be carefully timed, and forest management in the supply area must be planned beforehand to fit that timing. This planning of supplies calls for some measure of co-ordination among the woodland owners themselves, as well as between the woodland owners as a body and the industry concerned.

### The Need for Vertical and Horizontal Co-ordination in Forest Industry.

We may broadly distinguish two types of inter-dependence in the treatment of raw material. One is vertical, by which links are formed between enterprises which are placed at different stages along the production and marketing chain. The other is horizontal, by which links are formed between enterprises located at similar stages along different production chains.

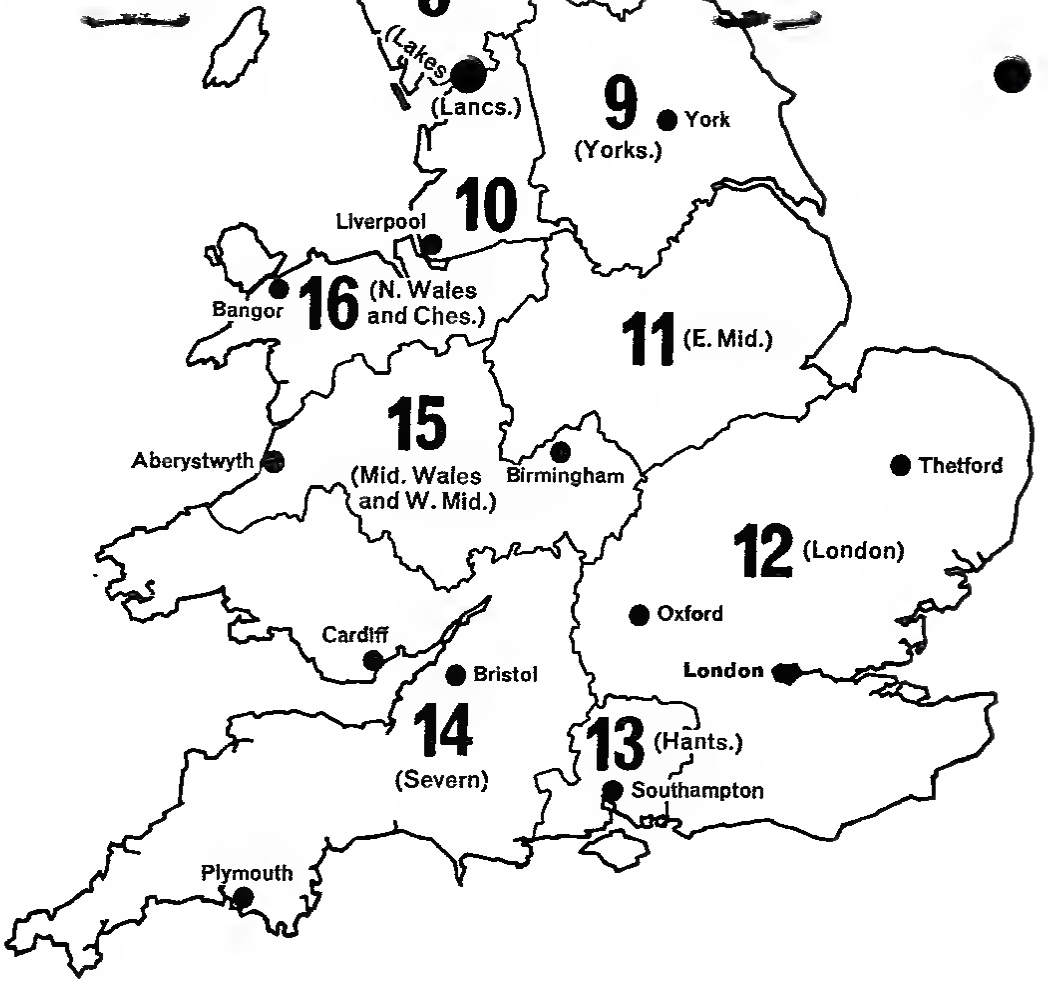


Fig. 1. Production Regions for Conifers. (See Table 4).

*N.B. These do not coincide with Forestry Commission Conservancies.*

The need for some degree of co-ordination between woodland owner and forest industrialist is obvious in a country like Britain where the rate of industrial expansion is limited by the small but increasing supply of wood. Much more difficult to decide is how far this co-ordination of effort should go and what form it should take. Should it be confined to long-term contracts to supply raw material, or should we seek to follow the example of countries where some of the major forest industries own forests and woodland owners have a stake in the industries? Equally important but of less concern to the grower is the question of vertical co-ordination within the industry itself, e.g. between pulp mills and paper-making plants.

The need for some degree of horizontal co-ordination has already been mentioned in connection with the fact that almost half of the wood consumed by a sawmill emerges as waste, and part of this could be used for pulping or chipping. While the forester is hardly in a position to comment on the appropriate organisation of horizontal co-ordination, he has a clear interest in the possibility of the process on account of the implications for (a) the mode of supply of raw material, i.e. whether to separate mills or to a joint enterprise, and, in the later case, whether in long lengths or in final log specifications, and (b) the resulting prices that may be paid relative to priees offered by enterprises which are not horizontally co-ordinated.

It appears that in the major wood-producing countries less progress has, on the whole, been made with horizontal than with vertical integration, although its advantages are recognised. A major difficulty lies in the different production and marketing conditions for the joint products of a horizontally integrated enterprise, which may call for quite different technological and management skills. A useful analysis of the complex problems of vertical and horizontal co-ordination is provided by R. Eklund in a paper entitled "Economic Strategy in the Integration of the Forest Industries" (Report of the FAO/ECE Symposium on Integration in the Forest Industries, Supplement 2 to Volume XX of the Timber Bulletin for Europe, 1967).

**Summary of Conclusions**

1. In the long-term, the import of roundwood is likely to become more difficult because the exporting countries are increasingly encouraging the export of semi-manufactured and manufactured wood products, and discouraging the export of roundwood.
2. The available supply of home grown coniferous wood is expected to rise from 2.3 million tons to 7.8 million tons between the years 1970 and 2000 (wet wood with bark).
3. Some degree of vertical co-ordination between growers and primary forest industries is essential.
4. Equally important is some degree of horizontal co-ordination. This applies to the forest industries as well as to the growers.

## THE FUTURE OF THE PAPER AND BOARD INDUSTRY BASED UPON HOME-GROWN PULPWOOD

By J. S. CURTIS

Predicting the situation for the pulp, paper and board industry in the United Kingdom in the years 1985 and 2000 *vis-à-vis* the supply of pulpwood which will be available, is an exercise which can only be useful if one tries to paint a broad picture and allows the picture to be modified and updated as time goes on.

The Forestry Commission and the private owners have a common aim in seeking to establish markets for their wood, and in assessing the market which is available to them for pulpwood and sawlogs. It is equally necessary for the Paper and Board Mills to established the probable size of their own markets and in order to do this it is necessary to make certain assumptions.

I have had the opportunity of talking to a number of my colleagues in the industry, and the contents of this paper are put forward with their observations in mind. But I should stress that the thoughts expressed are personal and cannot be taken as an official statement of the British Paper and Board Makers' Association.

It may well be that my assumptions are not the ones you would have made. This is not a bad thing at all because it will allow us, in discussion, to look at other alternatives. My first major assumption is that in the time-span with which we are dealing, a new chemical pulp mill, for market pulp, will not be built. This assumption has a rider that present chemical pulping methods will progress technically but will not change in basic concept. The justification for the assumption is two-fold: (1) the radius of haulage of pulpwood to an international-size pulp mill, in A.D. 2000, of 350,000 tons per annum would be uneconomic; (2) the difficulty of finding a suitable site with adequate water supplies for a bleached pulp mill of this size, facilities for effluent disposal and the acceptance, in the surrounding community, of the odours from a kraft pulpmill, though by 2000 this latter problem may be resolved.

This assumption does not preclude the expansion of the existing chemical pulpmill at Fort William and I hope this point will be dealt with in discussion.

If a suitable site can be found, it is not beyond the bounds of possibility to build an integrated bleached kraft pulp and paper mill of a smaller size than would be required for a market pulp mill, but even this mill would, in the light of trends internationally, need to be of the order of 150,000 tons per year capacity. This would involve a major marketing problem in the fine paper sector of the industry and would, I suggest, have to involve the closing down of many smaller mills in order to allow the production to be concentrated on one site.

This assumption, disregarding hardwood, leaves me very conveniently with the examination of the market for mechanical or groundwood pulp. The current market for mechanical pulp is divided into two sectors, the current imports of mechanical pulp and the imports of finished paper and board containing high proportions of mechanical pulp. Statement (1) shows you the 1966 and 1967 figures for both tonnage and value of imports of mechanical pulp. Statement (2) shows you the 1967 figures of major grades of paper and board containing high percentages of mechanical pulp. If we assume that the mechanical pulp content of these grades is approximately 75% and that these grades can be made economically in the United Kingdom, then, what I call the theoretical mechanical pulp market is 1.23m. tons per annum at 1967 figures and the value of this pulp at 1968 prices is £44m. Statement (3) is based on three different growth rates to the year 2000; 2%, 3% and 4%, and shows the tonnage and value at 1968 prices. One must add 25% to these figures for population growth.

**Statement 1.**

Imports of Mechanical Pulp:

| 1966 | | 1967 | |
|---|---|---|---|
| *Tons* | *Value* | *Tons* | *Value* |
| 770.000 | £22.8m. | 665,000 | £19.8m. |

1968 costs up 20%

1968 volume Jan./ March—20% up.

**Statement 2.**

| Imports of Paper and Board: | 1967 |
|---|---|
| Newsprint | 601,000 tons |
| Mechanical Printings | 76,000 tons |
| Wallpaper Base | 9,000 tons |
| Coated (Part Mechanical) | 12,000 tons |
| Duplex Folding Boxboard | 54,000 tons |
| | 752,000 tons |
| Approximate value — | £42m. |
| Approximate Mechanical content — | 560,000 tons |
| Total theoretical Mechanical Pulp Market 1967 — | 1,229,000 tons |

**Statement 3.**

Value of 1967 Theoretical Market at 1968 prices:

Pulp *Value* only £44m

Theoretical Pulp Market A.D. 2000:

| | *Tons* | *Value* (1968 *price*) |
|---|---|---|
| 2% per annum growth rate | 2.36m. | £ 84.6m. |
| 3% per annum growth rate | 3.26m. | £116.7m. |
| 4% per annum growth rate | 4.48m. | £160.5m. |

Add 25% for population growth.

This is the current position and possible future of the theoretical market for mechanical pulp. An arbitrary, but nevertheless I believe a realistic, assessment of the real market in A.D. 2000 would be half this tonnage.

The need in the market-place is for a pulp quality equal to that imported or used by Nordic countries in an integrated situation. These respective qualities are not the same thing, since certain physical characteristics of mechanical pulp, particularly those related to strength, are downgraded significantly quite rapidly after manufacture, and certain physical strength losses can be shown as soon as 48 hours after manufacture. It is quite clear from the operating experience of United Kingdom mills making groundwood pulp, either by grinders or by disc refiners, that the quality of the pulp produced is excellent.

The other requirement in the market-place is the price of the pulp. We all know that the price is, or at any rate should be, a function of cost. We have to define terms in which we express cost in relation to the import of pulp or finished products. The devaluation last year of sterling whilst the Nordic countries, with the exception of Finland, did not devalue, resulted in a different cost picture for the United Kingdom pulp mills in that, expressed in sterling, certain costs became more nearly comparable with Nordic costs whilst others increased.

The largest cost in a pulp mill is that of pulpwood and, post-devaluation, present United Kingdom pulpwood costs began to get into the same street as Nordic pulpwood costs, whereas previously they were not even in the same county. If valuation of currencies changed, this situation obviously would need reassessment.

Certain events have taken place in the Nordic countries, particularly Sweden, which have altered post-devaluation price relationship of pulpwood. In 1968 the price of pulpwood in Sweden has dropped by approximately 17% and in certain areas of Sweden the delivered price of pulpwood, expressed in sterling terms, is now 30% below that in the United Kingdom.

It seems clear that, to obtain pulpwood at competitive prices for the mill, and a satisfactory recompense to the grower, planting and harvesting methods need to be changed in order that pulpwood can, in suitable locations, be grown as a crop and be harvested by clear-felling methods, using mechanical equipment of many types which is now under development. This would involve not only a re-thinking in planting policy but a major engineering exercise to determine the type and cost of equipment which would be needed.

A corollary of this is the urgent necessity to reduce transport costs and have forest road systems which would allow the use of the largest vehicles permissible in the United Kingdom. This involves a financial exercise in comparing the extra cost of building heavier duty roads, as against the savings which would accrue in transport costs.

On the debit side, post-devaluation, the cost of power and transport has increased, and if one compares power costs on an oil-fired station in the United Kingdom with the cost in the Nordic countries, then the power cost per ton of pulp is double, and four times the cost in the United States. Power is the second biggest cost in a mechanical pulp

mill and one must ask, if special arrangements can be made for high power consumers, such as an aluminium smelter, to have preferential treatment, why not a pulpmill?

This gives the interesting speculation that if the aluminium smelter programme proceeds then presumably it will render certain existing smelters, dependent on water power, uneconomic, and this could release a low-cost supply of electricity in at least one area.

Another cost element which is significant is that of servicing capital. Irrespective of movements of the bank rate, this capital-servicing cost is heavily influenced by the economical use of capital equipment. I have heard the theory put forward that a groundwood mill can be of smaller size than a chemical pulpmill and can be easily expanded. This is quite true, but the argument then goes on to assume that relatively small-size groundwood mills, located near forest areas, are economically viable. This is a fallacy! The debarking requirements of a groundwood mill are much higher than those of a chemical pulpmill and therefore necessitate special types of equipment which have an irreducible minimum capacity. For the debarking of small diameter wood for groundwood pulp manufacture, it is not realistic to think of ring-type barkers, so that if the capital invested in a sophisticated woodyard, with a drum barker, is to be justified, then this determines the minimum size of the operation. It is probably necessary for the integrated pulp, paper and sawmill of the future to think of whole-tree logging with the commitment at the mill of slasher saws, log sorting decks and elaborate conveyor systems.

At today's costs of equipment and capital the minimum size is 100,000 air-dry long tons of pulp per annum (270,000 tons of greenwood on Dr. Hummel's conversion figures).

Assuming that the pulp mill is to be operated on an integrated basis with paper or board manufacture, this severely restricts the number of grades of paper and board which are manufactured in sufficient quantities to justify their own pulp mill, and it explains to some extent the grades of paper and board which are chosen to illustrate this in the Statements.

Statement 4 shows the 1967 production of certain grades of paper and board which, in the near future, would justify an integrated operation. Newsprint and board are already integrated by certain companies so far as groundwood pulp is concerned.

**Statement 4.**

United Kingdom Production 1967:

| | *Tons* |
|---|---|
| Newsprint | 702,000 |
| Mechanical Printings | 261,000 |
| Coated papers: | |
| Part Mechanical Printings furnish | 59,000 |
| Wallpaper Base | 95,000 |
| Duplex Folding Boxboard | 90,000 |

We have discussed the market and some of the cost elements. Where do we go from here? It is quite clear that from spruce grown in the United Kingdom we can manufacture suitable groundwood pulp adequate for the quality needs of the market, but the forestry and the paper and board industry have to work together to reduce the two major cost elements —wood and power.

The price of pulpwood delivered to a United Kingdom mill is more than three times the price received by the grower for the standing tree. If extraction and haulage methods can be improved it would be possible logically to arrive at a lower delivered price of pulpwood and a higher price for the standing tree, an incentive for the buyer and crop seller. In suitable locations a sawmill linked with a pulpmill to provide a source of chips is already an attractive proposition.

It seems clear that in order to utilise timber which is of sawlog size to maximum efficiency,

sawmill operations must be integrated with a means of using the wood residuals. It is my view that the sawmill should be located on the pulpmill site. There are two reasons for this statement: (1) that chips are bulky and are therefore expensive to transport any distance; (2) that to market sawn lumber competitively with imported lumber it is essential that the home-produced lumber is kiln-dried. A sawmill on a mill site gives access to quantities of relatively low cost steam, which is the most economical method of heating the kilns.

The cost of power is determined by the twin factors of Government intervention by taxation and by the research and development resources of the operating unit. I can offer no suggestions on how you control the former, but on the latter there is much to be done and much has been done.

In the case of my own Company's operation, using refiner methods of making groundwood pulp, we designed the pulpmill for a power usage of 80 horsepower days per ton. We started operating at 100; total control brought it down to the designed figure. Since then many experiments, trials and modifications have been carried out with the result, after 18 months' operation, that we are now at 60 horsepower days per ton, and the story is not finished by a long way.

A considerable amount of work is going on in many countries to further reduce power consumption; the general line being the pretreatment of chips by various methods which have the usual common feature of using heat in the process.

The underlying theme of this paper is the necessity for co-operation between the Forestry Commission and private woodland owners on the one hand and the paper and board industry on the other, and the continuing co-operation over a period of time in order that a tremendous opportunity for large scale import savings is attained in the interests of the national economy and of both our industries.

## SUMMARY OF GENERAL DISCUSSION

Much of the discussion centered around the importance of extraction and transport costs in the price of timber at the mill. Lord Dulverton suggested that a combined research effort should be directed to this problem. This suggestion was supported by Dr. Hummel on behalf of the Forestry Commission, and while Mr. Curtis of Thames Board Mills pointed out the difficulties of co-operating with the dispersed private growers, he also gave his support to the proposal as did Mr. Bennett of the Wiggins Teape Group and Mr. Colvin of the Bowater Paper Corporation.

In the discussion which developed around this topic, Mr. Dickson, Director General of the Forestry Commission, made the point that the cost of roads per acre or per hoppus foot was more important than the cost per mile, and that the public roads were often as much a limiting factor as the forest roads. Mr. James Bruce of the Scottish Woodland Owners Association suggested that the Government could help considerably in connection with the transport problem, and not least by making Investment Grants available for extraction and transport plant and equipment.

Mr. Baggallay of the Wiggins Teape Group thought there was considerable scope for technological advance in the field of extraction and transport, and Mr. Mence of Yattendon Estates suggested that the Forestry Commission might set up the equivalent of the National Institute of Agricultural Engineering. Dr. Hummel, said that the Forestry Commission Work Study Branch had already done much work in co-operation with industry, but that we

might expect to learn much from other countries where the larger scale of operation could support more research effort.

Mr. Rudd of Bangor University, and Mr. MacGregor of Oxford University said that research facilities were available and some transport projects were already under way. Mr. MacGregor felt that we could follow the example of the Tennessee Valley Authority in providing loans to small private contractors to invest in the latest mechanical equipment. Dr. Frankel, Chairman of the Association of United Kingdom Wood Pulp Producers, said he thought the use of a pulpwood price at roadside tended to divert effort which could be better spent reducing the extraction and transport costs of the complete process from stump to mill.

Mr. Grayson, Forestry Commission Economist, commented on the question whether or not to thin. He considered that, where thinning now appeared profitable because roading and harvesting costs are low in relation to the increased revenue attributable to thinning, thinning will generally remain economic even if clear-felling costs fall quite markedly compared with costs of thinning. Mr. Cooper, Chairman of the Association of Professional Foresters, suggested that the provision of more long-term contracts by the Forestry Commission would do much to encourage private investment in extraction and transport equipment.

Mr. Curtis, together with Dr. Gascoigne of Cross and Bevan, were the main speakers on another topic in the discussion—that of possible technological advances in the pulp industry, including the possibility of substitution by plastics. Mr. Curtis said that he did not foresee any changes in the basic concept of pulping, although as Dr. Gascoigne suggested there was scope for technological changes such as in the handling of effluent.

Mr. Campbell of the Economic Forestry Group pointed out that very little had been said about the other big wood users—the sawmilling industry. Mr. Curtis said in response to this that he felt the traditional sawmill was in a poor position to compete with imported lumber, and he stressed the important contribution which the chipwood element made to the overall success of their new integrated saw-mill at Workington. Mr. Gibson of Forest Products Research Laboratory suggested there were possibilities of technological improvements such as the development of saws which produced chips rather than sawdust.

Mr. Boyle of the Inveresk Paper Group suggested investigations into the possibility of grouping pulpmills, sawmills and forests to form viable production units, and more co-operation in planning between the State and private growers. Mr. Gibson asked what the potential of hardwoods was, and Mr. Savage of Sudbrook Pulp Mill made the point that the dispersion of hardwood areas limited their economic potential despite the fact that the possibility for expanding existing mills already existed.

## SUMMING UP : I

By J. A. DICKSON

I am in no two doubts about the difficulties that face the two Dicksons in trying to sum up the discussion we have had today. Equally, I am very conscious of the fact that inevitably I shall stray into the other Mr. Dixon's field, the only point is that he is at an advantage because he has the last say. What I have got to say is in part something on Dr. Hummel's paper, in part some points which have been brought out in discussion today, and I would like also to throw into the summing-up some personal opinions, not necessarily Forestry Commission opinions but personal ideas.

First of all let me say that we, as growers,

are glad to have had the opportunity of putting before you, the pulp producers, our paper on the figures relating to the production from forests, both private and State, in the next 30 years or so. We are also glad to have had the opportunity of discussing our difficulties regarding the possible future markets. I am particularly glad to hear from various speakers that the market is likely to exist to absorb the timber which is coming from forests, private and state. I also agree with Mr. Curtis that it is rather difficult, in a sense, to treat in detail with the picture relative to A.D. 2000. The objective in our minds was to put before you the figures so that you are conscious of them and can work towards absorbing the production.

The development of the wood-pulping industry is, with one or two exceptions, relatively new in this country. This is not the fault of the industry. The fact of the matter is that the timber did not exist in sufficient quantities on a guaranteed scale for the necessary capital investment to come forward. We, as growers, however, are glad to recognise the developments by certain companies in this field, and I would like to say that for my part I am particularly glad of the pioneering job which has been done by Dr. Frankel. We are glad that home timber has, and we as growers always had faith that it would, proven suitable for the manufacture of paper and board. We fully realise that home timber in certain of its characteristics is somewhat different from the imported timber, but not radically so.

We also recognise that there is now a distribution of small roundwood consuming industry in this country which can, if it develops as we hope it will and indeed expect it will, take care of a very substantial part of the production of small roundwood for the next decade and indeed in some cases two decades. There are, however, certain areas of the country where certain limited quantities of timber are available now. In common with other industries it is probable that large units will provide more competitive terms than will small units, except perhaps in specialised fields, and this is a fact that we, as growers, recognise; we also recognise that with this there are problems for the grower in relation to the supply of raw material.

The figures which Dr. Hummel has given relate to those forests which by and large are in existence. In general terms we do not thin woodlands until the woodlands are something of the order of 25 years old; indeed in some cases, depending on the species and on the quality of land, the plantations might be a bit older. It has been pointed out by Dr. Hummel that whilst the total production is fairly well fixed, variation can be introduced in the annual quantities, or indeed in the quantities over restricted periods, by adopting different forms of management. The growers, however, are concerned with obtaining the maximum return on their forest crops, and can only adopt management practices different from the optimum if there is some contributary form of compensation from the consumer.

The volumes given by Dr. Hummel were divided into certain class categories. I would say that today the class categories are fortuitous. By accident they may bear some relation to how the timber is utilised, indeed perhaps do so in the very short term, but not necessarily in the longer term.

Technological advances are always difficult to foresee very far ahead because the process of development is a continuing one. The delivered price of the raw material is a limiting factor as to where and how the timber is utilised and this, of course, as we all know, is dominated by the import prices. To me, however, it does seem that the future must lie in complexes which use the whole tree. Mr. Curtis has mentioned the need to take the whole tree into one site. So far as we are concerned, and I am not sure who can claim the credit but certainly it is a long long time ago since I started plugging the idea, the whole tree should go into a certain complex.

I think there is another point that I would drag in here and that is the point made by Mr. Colvin in relation to labour availability. It is a fact that in the areas where some of the forests exist labour is going to be in short supply in the long-term future, indeed it is already in some areas, and the consequence is that the more of the work we can get done in a central complex the better. In other words, one really wants to sell the whole tree to a manufacturer and let him get on with cutting into the bits and pieces which suit him best. This of course I realise is no new notion; it is something that is established in other parts of the world, but in this country it is in its infancy. I do not want to imply that these complexes need necessarily be on the same site, for I honestly do not know how far one goes on this. It seems fairly obvious that a pulpmill should have a sawmill, but as to how far one goes in transporting logs from long distances into this sawmill located beside the pulpmill I do not honestly know. Mr. Curtis has his opinion on it and he may well be right. I would not begin to deny that he may not be right, but so far as we are concerned this is something that we don't honestly know.

To my mind, rightly or wrongly, it seems that in the foreseeable future growers are likely to get bigger prices for sawlogs than for pulpwood. I realise that one cannot generalise; there must always be exceptions. Profile chippers, and there are, I stand to be corrected here, I think only three or four in the country, to my mind are likely to produce sawn lumber suitable for many purposes out of small-sized logs. Bearing in mind that the chips produced, that is the residue from the sawn lumber, can be utilised for chipboard manufacture or can be used for pulpwood manufacture, the profile chipper is likely to limit the amount of smaller diameter logs, that is 5 to 8 inch diameter logs, which will find its way into the pulpmills. I think this is of some consequence. Dr. Hummel has shown that in 1970 the quantity of below-7-inch material is 1.28 million tons and over-7-inch it is 1.06 million tons. But if one moves from 7 inches to 6 inches, the quantities are 1 million tons as opposed to 1.28 million tons, of material under 6 inches, and 1.3 million tons over 6 inches. Similarly in the year 2000 the figures are 4.37 million tons under 7 inches and 3.43 million tons over 7 inches; or coming back to 6 inches the figures are really reversed, 3.43 million under 6 inches and 4.3 million over 6 inches; there is a very very substantial difference to my mind.

Again another point which was made by Dr. Hummel was that something like 20 per cent of residue from sawing is utilisable for chipboard and pulp manufacture; I realise that this depends on the size of log, but nevertheless let us accept it as being a round figure. This means that in 1970 something like 200,000 tons of residue is utilisable from over-7-inch diameter logs, and 260,000 tons from over-6-inch. In 2000 the figures are 680,000 tons over-7-inches and 860,000 tons over-6-inches. These figures to my mind represent very handsome quantities of chip material for the pulp producer who has, for example, a disc refiner process to average his cost of raw material. There is a point which I do not think was touched on today and it seems to be becoming increasingly certain. I think it is a wee bit unfortunate that no sawmiller stood up to speak on this point, that the production of large-sized saw logs is not for us in the future. The idea of saw logs in the past were these mighty logs of 14 to 20 inches diameter. It does seem to me that the future must lie in the smaller-sized diameter, that is 5 to 8 inches perhaps for profile chippers, and 8 to 12 or 14 inches or something like that for conventional saws. I have heard from sawmillers who say they do not want any material over about 14 inches diameter. This may be wrong, I stand to be corrected by the sawmillers but this is the impression that one gets.

To move on from this, another problem, which is a problem for timber growers as well

as for the pulp producer, is tree species. We know at this juncture that what everyone wants is spruce, but as growers we are blessed with the species which our predecessors planted and we have to do our best to utilise these species to best advantage. I would point out to pulp producers that a high price for spruce may be of little interest to the grower if he has to burn the less desirable species. We would ask pulp producers to do their best to utilise species other than spruce, or certainly a proportion of species other than spruce. I would here issue a word of warning; we for our part, and I am sure the private growers too, today plant as much spruce as humanly possible, but there is little point in planting spruce if it will not grow, so I am afraid that the probability is that something like a third of the trees that we shall plant in the future will be species *other than* spruce. This of course as I realise depends entirely on the land quality, but nevertheless this is my forecast of what is likely to happen. I will go this far to say that a much smaller proportion of larch is being planted than was planted in the past, wbich no doubt is a blessing in disguise. What seems to us to be wanted is some simple bleaching process tied on to mechanical pulpmills to deal with the other species. Mr. Curtis said, I think fairly categorically, that he did not foresee that there would be any new chemical pulpmills so that one would hope that there is some simple bleaching process tied up in the mechanical pulpmill to take care of the other species.

Dr. Hummel has put before you the growers' problems on size and location of industrial plant. We realise of course that the pulp producers have also problems in the same field. Sometimes we as growers can see clearly what should be done, sometimes not. We tbink at times, and perhaps I say this a little lightheartedly, that the Development Grant available in a district appears to be a greater incentive than the long-term benefits of the industrial development being sited near the sources of raw material and thus having the benefit of reduced haulage costs. A point I would make here, is that the forests which have been created by the Forestry Commission were, until 1958, created for strategic reasons, or largely strategic reasons, and since then they have largely been for social reasons. Dr. Frankel has spoken of the need for scale in relation to new plantings in the far-flung parts of Britain. I would agree with him here. It is perhaps unfortunate that we do not have a map here which shows the distribution of Commission forests, and the distribution of private estate forests, available for you to see, because I am sure you will see that a scatteration is such that it is largely a process of linking up of blocks nowadays. Within limits, therefore, we would hope that industrial developments will fit in with the pattern of forests, State and private, which exists in this country. The problems of costs, particularly of haulage costs, are, we realise, of paramount importance and we don't deny for a moment the importance of tlus particular issue and the issue raised by Mr. Baggallay, on which I commented, on public roads.

In the industrial developments in the past we, that is the Forestry Commission, and more recently we have pulled in private growers too, have co-operated closely with the companies concerned on such problems as quantities, species and specification. At times I think you may feel that our information has been somewhat limited, and indeed I know it has been limited a number of years in the past, but today I don't think that it is so limited. There is room for criticism in the fact that there has been a tendency to sectionalize the industry into selling and extraction to roadside, and into transport and conversion in the pulpmill. This is, I think, unfortunate; Dr. Frankel explained why to a certain extent it has arisen in the past. We fully realise that a co-ordinated scheme from the standing tree to the chip has to be worked out in the future.

In the timber consuming field there is

intensive competition from abroad. It is, in my opinion, in this competitive world, essential for the maximum return both to the pulpmill and to the grower, that there should be close co-ordination of effort so as to reduce costs to the mutual benefit of both sides. I am glad to hear numerous offers of co-operation from the pulp and paper producers. We for our part require a pattern of industry which would best fit in with the supply of raw material, so that there is not only the best return for the industry but there is also the best return to the grower. It has been emphasized by the growers, and indeed by Dr. Frankel, that the grower certainly needs a higher share of the end price.

## SUMMING UP : II

By P. DIXON

It is quite a change I think for the paper-makers to have the last word—usually we get the thin end of the wedge. It is my task to try and high-light the few comments that have been made today on behalf of the paper-makers as I see they affect us.

I think the first one we have all learned is that to set up a pulp mill is quite a long term project; we have got to try and know where the trees are and so on, and whether they are the right sort of trees. Dr. Frankel and other speakers have stressed the necessity for very careful planning and for utmost co-operation between the ultimate user and the growers, whether they be Forestry Commission or private growers.

The other point that has been brought home possibly is the economy of scale. Mr. Curtis said that even chemical pulp mills had to have at least 350 thousand tons capacity. Those of you who have been over to British Columbia or other parts of the States or even Scandinavia know that that is, these days, almost a small mill and therefore I think it is not feasible for us not to think of anything on that scale in England. We then come down to the question of a groundwood mill; a figure of 100 thousand tons was suggested. Whether that is economic or not I do not know, but there are not many people in this country who could use a 100 thousand tons of groundwood a year; maybe some of the newsprint mills could. Again we get this question of location and I think it was Dr. Hummel who mentioned traditional sites and so on.

Paper mills, particularly those using groundwood, have been located at ports where wet groundwood can be brought in at as low a cost as possible, and those places do not unfortunately happen to be the places where the trees are growing. It was Mr. Curtis who reminded us how the quality of groundwood deteriorated so quickly. All right, you might say, let's pick up the paper mill and take it to the pulp mill, but I do not think anybody could pick up four or five paper machines and take them up to the Highlands of Scotland. It just would not be on. Again we have the problem today of Development Grants. These are very attractive for development areas. Again a lot of the paper-making centres of this country are not in development areas and we do not enjoy these grants. I think it was one of the tree growers who said he would like to have the grants. Well, *we* do not get them to a full extent either. Finally, paper-makers must have their raw material at as low as possible a cost. We have to compete with not only Scandinavian competitors but North American as well, and much as we would like to pay the money that would allow tree growers to make a welcome return, this question of costs is an extremely difficult and important one. We have heard how serious is the question of transport and the effect that that has on the costs.

Again today we have all the problems associated with the Transport Bill in our own paper-mill operations, but I think we will welcome the possibility of research and development being done on this very important problem. Mr. Curtis mentioned fuel costs. We have all been very interested in the possible developments with the Coal Board and the Central Generating Board as for the smelters, but whether the paper industry can get Government intervention in that way—it would be a miracle! I think we always try to find ways of getting Government intervention but we always run up against a stone wall and get nowhere.

Finally I would like to thank Dr. Hummel for all the trouble he took in preparing his paper; Mr. Curtis as well. He is well known to most of the paper-makers here and we know that he can do a good job when he speaks up for us. Also to all those who asked questions and those who advertised themselves and to those who made other sorts of statements, may I say thank you very much for coming here today and making this such an interesting conference.

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